Chapter 5
The Middle Out Approach

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ABSTRACT

The Middle Out approach is a method to introduce ICT education in developing countries. The basic idea is to start at the level of a Polytechnic University that starts with the introduction of an ICT program and an Education program with an underlying educational philosophy of learning-by-building. In the form described in this paper, the students build, maintain, and explore ICT infrastructure both on a personal and material level. Its practical component directly results in market-oriented products; the theoretical component has a constructive and entrepreneurial flavor. This will enhance a short-term return on investment.

INTRODUCTION

According to Evoh (2009): *"Poverty in all its manifestations – hunger, illiteracy, sickness, unemployment, political disengagement – are directly or indirectly associated with lack of information."* A frequently seen vicious cycle, what may be called the *education paradox*, is that children do not receive proper education, therefore don't obtain a proper job, and therefore like their parents, cannot afford proper education for their own children. Several authors have described the introduction of ICT in a developing country as an opportunity to break this cycle (see Marker et al., 2002). The general idea is to break the cycle in the educational phase. Lack of infrastructure, both material and personal, is a serious burden. In this paper we propose a strategy based on the idea of breaking the education paradox which may be characterized as transforming this vicious cycle into an up going spiral.

There have been a number of attempts to bridge the digital divide by developing low-cost computers. These computers were designed to operate under hard environmental conditions, and easily approachable (for special target groups) via

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a special easy-to-use interface. Low-cost computers are seen as a primary condition to enhance access to technology in developing countries. The introduction of technology in developing countries may be approached from two sides. The top-down method is to introduce ICT industry as a macro-economic mechanism to stimulate economic growth. The bottom-up method works on the micro-economic level, and links ICT to human development (see Pal et al., 2009).

The low-cost computer initiatives could be seen as top-down, macro-economic implementations. Although ambitious, these initiatives so far have not been a commercial break-through. Some famous examples are: the Simputer (Chandru et al., 2001) and the OLPC: One Laptop Per Child (Negroponte, 2005). The Simputer was very promising, but did not enter the production phase. The OLPC still has to prove its concept in practice. In the meantime, the netbook has entered the Western market as a low-cost general-purpose computer and is expected to be very successful. A drawback for developing countries however is that netbooks, unlike the OLPC computers, have not been designed to operate under hard environmental conditions.

The mobile phone shows that a proper design may lead to a successful introduction of technology in developing countries, thus giving many people access not only to the phone network but also limited access to the Internet. Especially in rural areas, the mobile phone is (community) shared device. This is in line with the findings by Pal et al. (2009) when they conclude: "*sharing is not just one of economic need, but is strongly embedded in cultural approaches to learning and asset use*".

However, the availability of mobile phones and low-cost computers as such is not sufficient to bridge the digital divide. According to Gurstein (2003) the digital divide is to be measured as the effective use of ICTs. An initial availability of basic material like computer hardware and software can only sustain and lead to progressive exploration if at least infrastructure and education are taken into account. The infrastructure in developing countries is still far behind in large areas. Making computers less dependent on infrastructure is a contribution to smoothen this problem. For example, power failure and other poor environmental conditions can be overcome by special design. But the awareness of ICT as a 'partner' in daily life will require education.

An interesting conclusion from Pal et al. (2009) is: "*However, the largest challenger [for low-cost computer projects] has been the neighborhood PC assembler, who puts together a computer with parts purchased off the shelf and shows up at the doorstep to fix things when stuff stops working"*.

The intention of the Middle Out Approach is to strive for computer education and infrastructure by setting up a teaching institute involving a local computer factory. The computer factory will act as the *neighborhood PC assembler*. The computer factory will function as a practical driver for the educational program. We describe an overall introduction plan of ICT education on all levels, the primary, secondary and tertiary educational level. This introduction not only covers computer and Information Science but also Educational Science. Our central principles are:

1. *Introducing infrastructure and building educational capacity should be combined*.

Infrastructure and capacity are linked concepts like two sides of the same coin. This phenomenon has been recognized by others also, see for example Kennisnet 2008. Their method "Four in Balance" adds two other pillars required for ICT to be successful in an educational context: (1) vision and (2) availability of material. In this paper we will not consider these other two pillars.

2. *There should be a short return on investment*.

Following the first "principle", we conclude that learning should lead to building. An immediate consequence for our dualistic approach